

## Description of *Conchapelopia hittmairorum*, spec. nov., and redefinition of similar western Palaearctic species\*

(Insecta, Diptera, Chironomidae, Tanypodinae)

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*Conchapelopia hittmairorum*, spec. nov. is described as male and female adults, pupa, and larva, based on individual rearings from the river Alz, Bavaria, Germany. *C. pallidula* (Meigen, 1818) is redescribed, and a male reared from larva is designated neotype. *C. triannulata* (Goetghebuer, 1921) is redefined as a separate species based on a rediscovered syntype, and its adult female, pupa, and larva are described for the first time. *C. viator* (Kieffer, 1911) is redescribed, including the first association of an adult female. Previous synonyms of *C. pallidula* are re-evaluated, some upon new recognitions of type material. *C. puncticollis* (Goetghebuer in Thienemann, 1936) is considered a nomen dubium. Keys to western Palaearctic species are given for adult males and pupae. Morphological definitions of *Conchapelopia* Fittkau, 1957 are emended. The type material shows the wing of *C. zairensis* Lehmann, 1979 to be patterned, not pale as originally described.

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### Introduction

Between April 1997 and March 1998 several larvae of *Conchapelopia* Fittkau were collected in the river Alz, SE Bavaria, Germany. Attempts at rearing were successful and yielded individual larva/pupa/adult associations of *C. pallidula* (Meigen); a species previously known only as pupal exuviae, *C. Pe 1* of Langton (1991); and a third species with male genitalia similar to *C. viator* (Kieffer).

Definition of the new species was complicated by the fact that recent usage of the names *C. pallidula* and *C. viator* had not been sufficiently based on type material. Therefore, in order to provide a stable solution, a comprehensive re-examination of relevant specimens was undertaken.

\* Dedicated in gratitude to the late Dr. Friedrich Reiss. From the very beginning of our work he had supported us whenever it was necessary. His profound knowledge and invaluable advice are dearly missed and gratefully remembered.

## Methods

For rearings larvae were individually placed in petri dishes kept in an enclosed but unheated porch. They were fed *Tubifex* worms and small chironomid larvae of species not exhibiting long body setae, as the latter were repeatedly observed to keep *Conchapelopia* from taking such prey.

All new specimens are slide-mounted in Euparal. Measurements were made according to Schlee (1966). Terminology follows Sæther (1980) wherever applicable for adults and larvae, Langton (1991, 1994: 'taeniae' instead of 'lateral filamentous setae') for pupae, and Roback (1981) for some details not treated by the preceding authors.

Because of the great similarity between some species in certain life stages, only reared associations are designated as type specimens below. Analogously, a distinction is made in the lists of "Material examined" between "described" specimens and others "also determined" by the authors but not analyzed in all details.

Morphological features not treated below agree with the respective generic descriptions for *Conchapelopia* of Murray & Fittkau (1989: adult male), Fittkau & Murray (1986: pupa), and Fittkau & Roback (1983: larva).

## Abbreviations

BMNH	The Natural History Museum (British Museum), London
IRSN	Institut Royal des Sciences Naturelles de Belgique, Brussels
MNHN	Muséum National d'Histoire Naturelle, Paris
MUB	Masarykova Univerzita, Dept. Zoology, Brno, Czech Republic
PHL	coll. P. H. Langton, Londonderry, Northern Ireland
ZSM	Zoologische Staatssammlung, Munich
F	female adult
Le	larval exuviae
M	male adult
Pe	pupal exuviae
ph	pharate adult

## Genus *Conchapelopia* Fittkau, 1957 – Emendation of diagnosis

Adult male (vs Murray & Fittkau 1989). Temporal setae medially in one or more rows or a small cluster. Anteprenotal setae up to 13, preepisternals present or absent. Mid tarsomere

3 apical tuft of setae not always evident. Distinct pulvilli sometimes present.

Adult female genitalia (vs Sæther 1977). Gonotergite IX can be without setae.

Pupa (vs Fittkau & Murray 1986). Anal lobe inner margins can be strongly convex and touching medially.

## Keys to western Palaearctic *Conchapelopia* Fittkau

### Adult male

(Requires slide-mount of genitalia in dorsal view)

1. Anterolateral corner of median volsella with elongate projection, dorsolateral margin of volsella concave (e.g. Murray 1987: figs 9A, 10A, 14) ..... not studied: *C. aagaardi* Murray, *C. abiskoensis* (Goetghebuer), *C. cygnus* (Kieffer), *C. intermedia* Fittkau, *C. melanops* (Wiedemann)  
– Anterolateral corner of median volsella with at most a very short projection (Figs 22-25), dorsolateral margin of volsella slightly convex, straight or sinuous ..... 2.
2. Anterolateral corner of median volsella rounded, not projecting laterally; ventral lobe present, densely covered with microtrichia; dorsolateral processes gradually tapering. (Figs 15, 24, 25) ..... 3.  
– Anterolateral corner of median volsella with very short lateral projection; microtrichiose ventral lobe absent; dorsolateral processes partially expanded. (Figs 22, 23) ..... 5.
3. Pulvilli distinct, relatively wide and plumose (Fig. 19). Wing pale, without pigmented setae or membrane areas. Preepisternal setae present ..... *C. viator* (Kieffer)  
– Pulvilli narrow and with few projections (Fig. 16). Wing at least weakly patterned due to areas with pigmented setae. Preepisternal setae present or absent ..... 4.
4. Preepisternal setae present. Wing membrane distinctly darkened around crossveins. Each tibia with a subbasal, brown band .....  
..... *C. trifascia* (Freeman);  
Israel, Saudi Arabia, Afrotropical  
– Preepisternal setae absent. Wing pattern faint, from pigmented setae only; crossvein

area pale. Tibiae without bands. Hypopygium: Fig. 15 ..... *C. triannulata* (Goetghebuer)

5. Dorsolateral margin of median volsella nearly straight, lateral processes only weakly expanded and curving (Figs 2, 23) ..... *C. hittmairorum*, spec. nov.
- Dorsolateral margin of median volsella slightly sinuous; most lateral processes strongly expanded distal of approximately rectangular bend (Fig. 22) ..... *C. pallidula* (Meigen)

### Pupal exuviae

(Adapted from Langton 1991; pupae of *C. abiskoensis* (Goetghebuer), *C. cygnus* (Kieffer) unknown)

1. Anal lobes medially strongly convex (Fig. 3). Thoracic horn as in Fig. 5, anterior edge curved. Anterodorsal thorax granulation usually limited to just anterior of thorax comb, at most with another, small, clearly separate patch near anteprenotal region ..... *C. hittmairorum*, spec. nov.
- Anal lobes medially not strongly convex (Fig. 11). Thoracic horn anterior edge curved or straight. Anterodorsal thorax granulation extending from anteprenotal region to thorax comb, or limited to the former ..... 2.
2. Anterodorsal thorax granulation minute, not extending to thorax comb ..... *C. intermedia* Fittkau
- Anterodorsal thorax granulation stronger and extending at least to thorax comb .... 3.
3. Thoracic horn rim (= corona) indistinct or absent; respiratory atrium either also indistinguishable, or widening long before its connection to the plastron plate ..... *C. aagaardi* Murray, *C. melanops* (Wiedemann), *C.* "spec Lappland" of Fittkau; see Langton (1991)
- Respiratory atrium narrow until close to its connection to plastron plate; rim usually distinct (Figs 13, 18, 21) ..... 4.
4. Abdominal tergite armament mostly of sparse, rounded tubercles, multi-branched spines confined to a discrete pattern (Harrison 1991: fig. 62); posterior transverse band connected to pair of anteriorly directed

hook-shaped bands. Thorax surface conspicuously granular, including posterior regions. Thoracic horn with large plastron plate and relatively narrow rim (Harrison 1991: fig. 61) ..... *C. trifascia* (Freeman); Israel, Saudi Arabia, Afrotropical

- Abdominal tergite armament mostly dense, with extensive areas containing bifid or multi-branched spines. Posterior thorax regions at most very weakly granular ..... 5.
- 5. Anterior edge of thoracic horn curved; rim wide: maximum diameter of plastron plate at most 0.60 of rim (Fig. 21) ..... *C. viator* (Kieffer)
- Anterior edge of thoracic horn more or less straight; rim narrow: maximum diameter of plastron plate at least 0.70 of rim (Figs 13, 18) ..... 6.
- 6. Anterodorsal thorax granulation of apically rounded tubercles up to 8 µm high ..... *C. pallidula* (Meigen)
- Anterodorsal thorax granulation of tubercles up to 4 µm high, their apices irregular, often acute ..... *C. triannulata* (Goetghebuer)

### *Conchapelopia hittmairorum*, spec. nov.

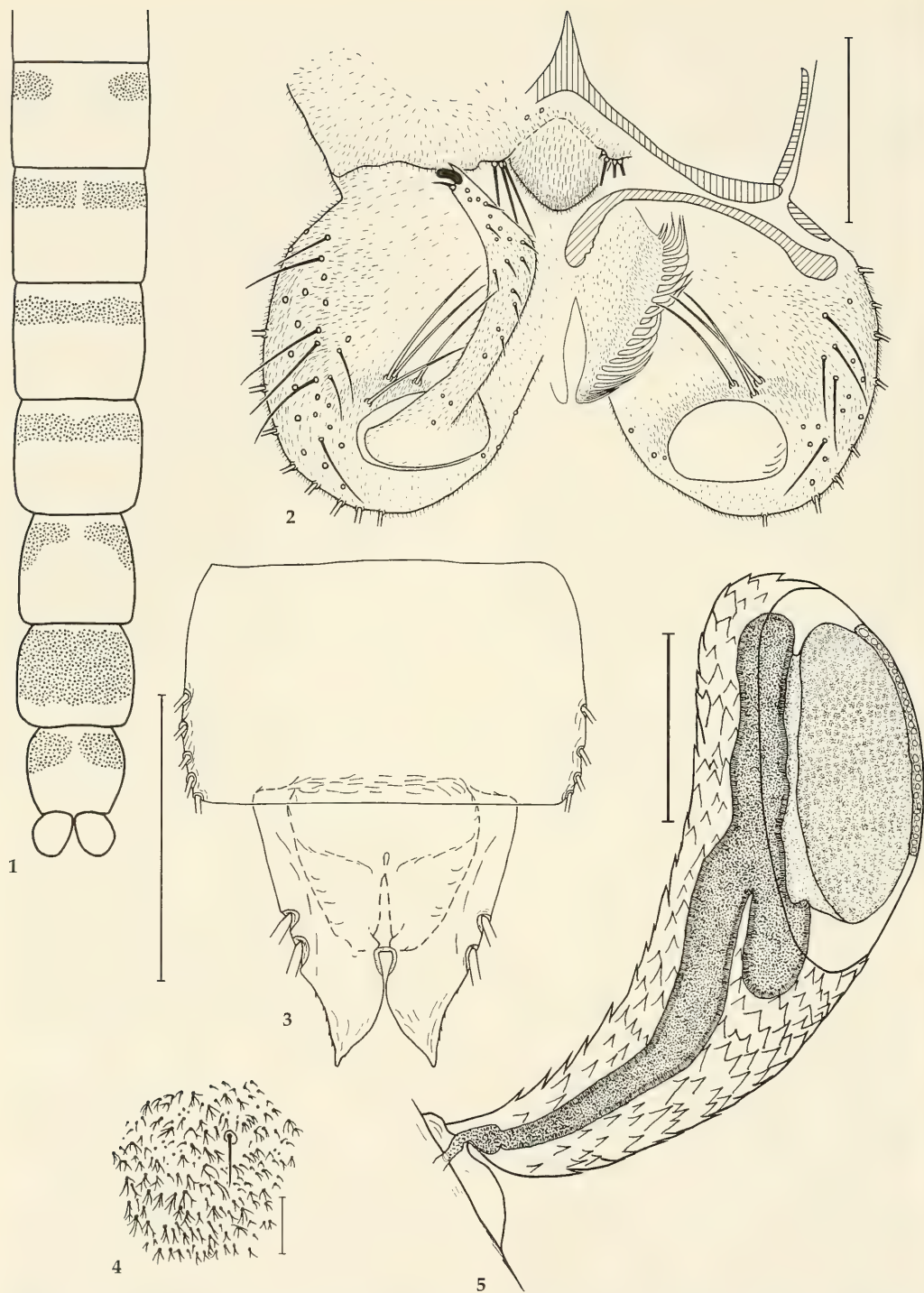
Figs 1-10, 23

*Conchapelopia* Pe 1 Langton (1991: 32) – pupa in key.

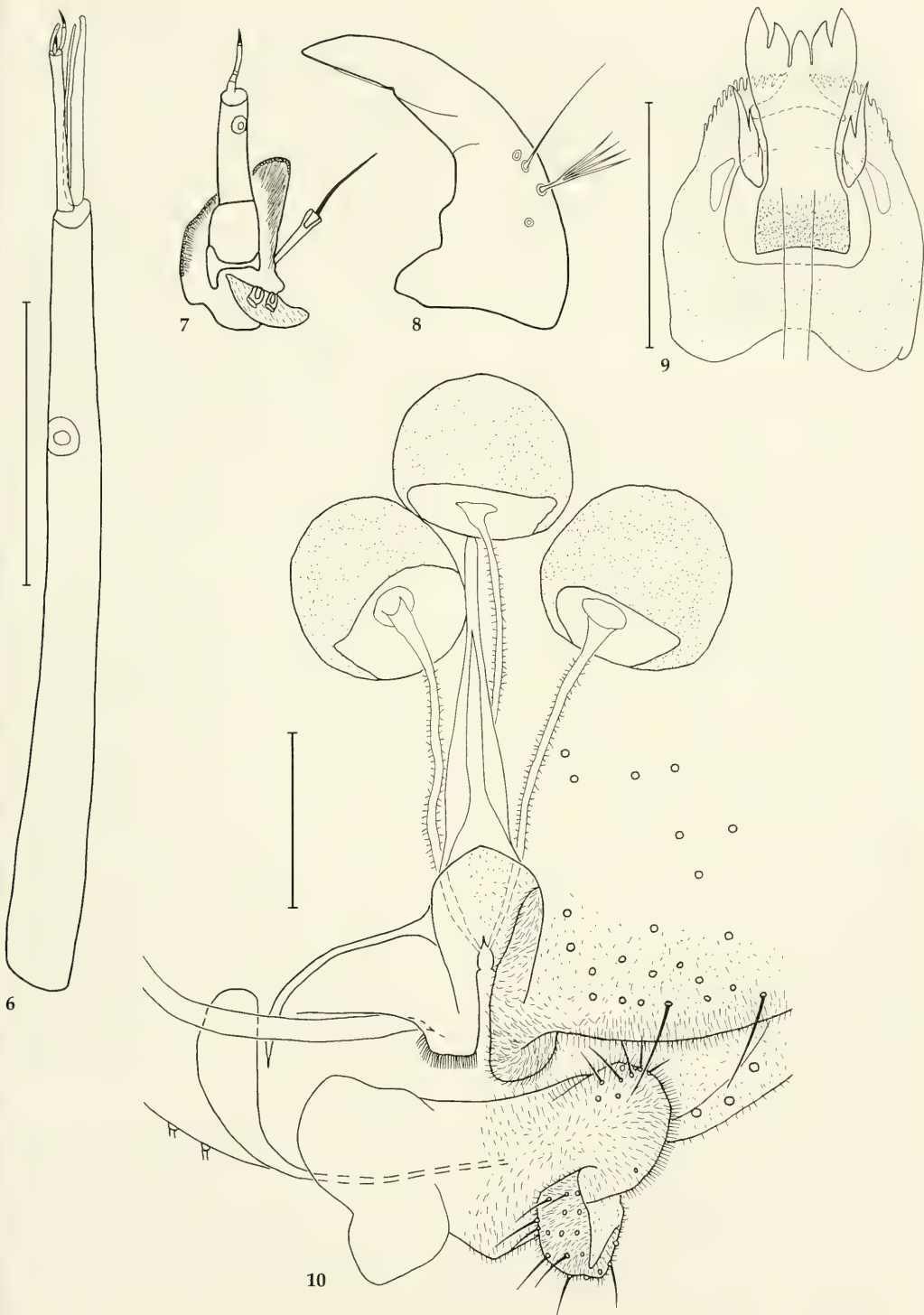
#### Material examined

1. DESCRIBED. Holotype: M+Pe+Le, on 1 slide, in Euparal, deposited at ZSM; GERMANY, Bavaria, river Alz, Hohenwardt, 48°12' N 12°46' E, 390 m a.s.l., 21.III.1998, leg. S. Michiels. 26 Paratypes, as holotype except: 11.V.1997: 1 M+Pe+Le; 15.VI.1997: 1 F+Pe+Le; 22.VIII.1997: 2 M+Pe, 2 F+Pe+Le; 18.X.1997: 2 F+Pe+Le; 14.II.1998: 3 M+Pe+Le; 21.III.1998: 9 M+Pe+Le, 6 F+Pe+Le; deposited at ZSM, BMNH, and in coll. Michiels.

2. ALSO DETERMINED. AUSTRIA (at ZSM): Niederösterreich, Lunz, Biol. Station, 1972, H. Malicky: 1 M; Kammelbach, Wechling, 17.VII.1973, H. Rausch: 1 M; Schauboden, Erlafschlucht, 12.VIII.1973, H. & R. Rausch: 1 M; Kärnten, Treffau, 13.VII.1979, H. Malicky: 1 M; Feistritz, 24.X.1979, H. Malicky: 1 M. FRANCE: "upper" river Rhone, Jons, 17.VII.1985, ex coll. H. Laville (ZSM): 1 Pe. GERMANY (ZSM unless stated): Nordrhein-Westfalen, river Ruhr at Freienohl, 23.VIII.1911, A. Thienemann: 1 Pe; Hessen, river Fulda, 14.VIII.1952, E. J. Fittkau: 1 pHM+Pe; Baden-Württemberg, river Rhein, Griefsheim, 21. IV.2000, S. Michiels: 1 Pe (coll. Michiels); Bayern:



**Figs 1-5.** *C. hittmairorum*, spec. nov. 1-2. Adult male. 1. Abdominal pigmentation, dorsal. 2. Hypopygium, dorsal; scale bar: 100  $\mu$ m. 3-5. Pupa. 3. Abdominal segments VIII, IX; scale bar: 500  $\mu$ m. 4. Tergite VII: seta D<sub>2</sub> and armament; scale bar: 20  $\mu$ m. 5. Thoracic horn; scale bar: 100  $\mu$ m.



**Figs 6-10.** *C. hittmairorum*, spec. nov. 6-9. Fourth instar larva. 6. Antenna. 7. Maxilla. 8. Mandible. 9. Ligula, paraligula, pecten hypopharyngis. 10. Adult female genitalia, ventral. Scale bars: 100  $\mu$ m (7-9. to scale).

Allgäu, Leuthenhofener Moos, 29.X.1976, H. Mendl: 1 M; river Altmühl, M. Werner, 17.VI.1982: 1 phF+Pe, 10.IX.1982: 1 Pe; Dietramszell, Zeller Wald, 15.VIII.1997, at light, W. Schacht: 1 M; München, Zool. Inst., 31.VII.1997, E. G. Burmeister: 1 M; Isarkanal, Lands-hut, E. Hieber, 29.VII.1983: 1 Pe, 6.VIII.1983: 1 Pe. GREAT BRITAIN (PHL): England, Yorkshire, river Wharfe, Barden Bridge, 23.VII.1971, P. J. Bright: 1 Pe; England, Herefordshire, river Wye, Bredwardine, 2.VI.1982, P. H. Langton: 1 F+Pe. SWEDEN: Småland, lake Vättern, Visingsö, 14./15.VIII.1946, L. Brundin: 1 M; Lüle Älv, Ligga-Damm, 5.VIII.1955, Müller: 7 Pe (ZSM). SWITZERLAND: Aargau, river Rhein, Koblenz, 8.IX.2000, S. Michiels: 1 Pe (coll. Michiels).

**Diagnosis.** Adult males of *C. hittmairorum*, spec. nov. and *C. pallidula* (Meigen) together are separable from other *Conchapelopia* by the combination of pigmentation pattern and hypopygium structure as described below. From each other the two species differ only in details of the median volsella which in *C. hittmairorum* has a slightly lower length/width ratio (1.2-1.3 vs 1.5 in *C. pallidula*), the dorsolateral edge straight (vs slightly sinuous), and the dorsolateral processes evenly curving and slightly expanded (vs angulate and distinctly expanded subapically).

Among the species and specimens studied here, associated adult females of *C. hittmairorum*, spec. nov. were distinguished only by the following combination: preepisternal setae absent; pulvilli minute, indistinct; wing length < 3.05 mm; vertical setae at most 12; prealar setae less than 40; supraalar setae 2;  $LR_1 > 0.65$ . However, all but the first two of these character states are considered dependent on body size and likely to extend into other species' ranges when more associated specimens become available. Consequently, unassociated females can not be reliably separated from *C. pallidula*, *C. triannulata*, and possibly other species without preepisternal setae and extensive pulvilli.

The pupa of *C. hittmairorum* is distinguished by the pronounced median swelling of the anal lobes, and by a characteristically reduced thorax granulation pattern.

The larva is presently inseparable from any *Conchapelopia* species studied here.

**Etymology.** The species is named after Brigitte and Paul Hittmair, the parents of the first author, who have made her studies possible and have supported them all along.

## Description

Where applicable, data presented as: holotype (paratypes in parentheses).

**Adult male** (n=10 unless stated).

Total length about 5 mm, wing length 2.91 (2.74-3.02) mm.

**Coloration.** Palp light brown. Median vittae (anterior ends) and median anepisternum II often with brown areas; lateral vittae (anterior ends), supraalar callus, and anterior anepisternum II occasionally pigmented. (According to Kobayashi & Hayashi 2001, Japanese *Conchapelopia* show considerable intraspecific variation in scutal marking patterns. The same has been observed for the European species treated here.) Legs pale. Wing patterned due to areas with pigmented setae (see Fittkau 1962: fig. 161): longitudinal patch in cell an, band across beginning of distal wing half, variable patch at tip of wing from about  $R_{4+5}$  to  $M_{3+4}$ ; squama (membrane) with distal brown patch. Abdomen (Fig. 1): tergite II with brown antero-lateral pigment patches, T III-VI with anterior transverse brown band, T VII brownish in anterior  $\frac{3}{4}$ , T VIII with anterior brown patches which may be confluent in the middle, gonocoxite and gonostylus unpigmented.

**Head.** Temporal setae 23, 27 (19-27), uniserial, including 14, 17 (10-17) verticals and 9, 10 (7-11) postorbitals. AR 2.06 (1.81-2.07); pedicel with 4+2 (4-7+1-2) setae. Clypeus with 25 (23-31) setae. Palpomere length increasing from Pm1 to Pm5; Pm2 without "brush".

**Thorax.** Anteprenotal setae 10, 11 (5-13), all lateral of large tubercle (= pronotal organ of Fittkau 1962); acrostichals 58 (50-60), dorsocentrals and humerals combined 32 (27-42), prealars 31, 33 (18-33), preepisternals 0, supraalars 2 (exceptionally 3); scutellars 49 (34-53).

**Wing.** VR 0.90 (0.88-0.95). Squama with 48 (43-54) setae in mostly single, proximally irregularly double row.

**Legs.** Tibial spurs with 6-9 side teeth; spur length on fore ti 54 (48-56)  $\mu$ m, on mid ti 58 (57-65) and 74 (65-74)  $\mu$ m, on hind ti 54 (44-59) and 95 (82-103)  $\mu$ m. Comb of hind tibia with 7 (7-9) spines. BR<sub>1</sub> 5.7 (4.4-7.7); tarsomere 3 of mid leg with apical tuft of 9 (9-12) stronger setae. Pulvilli minute, indistinct. Segment lengths are given in table 1.

$LR_1$  0.82 (0.80-0.91),  $LR_2$  0.59 (0.54-0.59),  $LR_3$  0.71 (0.63-0.74).  $BV_1$  2.44 (2.44-2.56),  $BV_2$  3.48 (3.26-3.54),  $BV_3$  2.49 (2.36-2.56).

Hypopygium (Fig. 2). Tergite IX setae (on ridge around anal point origin): 12 (12-24), including 4 (3-5) on each ridge end. Median volsellae basally fused, length 112 (110-134, n=16)  $\mu\text{m}$ , combined basal width 92 (86-104, n=16)  $\mu\text{m}$ , length/basal width about 1.2-1.3; anterolateral corner of volsella with very short projection, dorsal part of each volsella distally tapering to slightly enlarged apex, dorsolateral edge nearly straight (Fig. 23), with row of 16 processes (12-18, n=16; those concentrated at apex not counted), processes curving to anteroventral, slightly expanded medially (Fig. 23, detail); ventral part of volsella without microtrichiose lobe. Gonocoxite with 3 (2-4) strong distal-dorsal setae anterior to insertion of gonostylus. Gonostylus without distal-median tubercle or projection near origin of megaseta.

#### Adult female (n=5 unless stated).

Similar to male except as follows.

Total length about 3.2 mm, wing length 2.60-3.02 mm.

Pigmentation of thorax and wing as in male, but generally stronger (as noted by Fittkau 1962 for *C. pallidula*); anterior ends of median vittae always pigmented. Abdomen pale.

Head. Antenna with 11 flagellomeres, AR 0.30-0.34; scapus setae 5, pedicel setae 8-11. Temporal setae 15-21 (including 9-12 verticals in partly double row, and 6-9 postorbitals). Clypeus with 23-27 setae.

Thorax. Anteprenotal setae (n=12): 0-7 median, 4-16 lateral; acrostichals 45-65, dorsocentrals and humerals combined 38-52, prealars 20-36, preepisternals 0, supraalars 2, scutellars 43-56.

Wing. VR 0.87-0.91. Squamal setae 39-50.

Legs. BR<sub>1</sub> 4.2-4.4; mid ta<sub>3</sub> setal tuft absent. Segment lengths are given in table 1.

LR<sub>1</sub> 0.79-0.81, LR<sub>2</sub> 0.58-0.61, LR<sub>3</sub> 0.66-0.70. BV<sub>1</sub> 2.56-2.71, BV<sub>2</sub> 3.24-3.46, BV<sub>3</sub> 2.41-2.62.

Genitalia (Fig. 10) as in Sæther (1977) except as follows. Sternite VIII with about 50 setae around genital bay, most densely placed near posterior sternite margin. Gonocoxapodeme VIII weak. Gonapophysis VIII with projecting, rounded caudomesal angle. Notum about as long as rami. Gonotergite IX without setae. Segment X anterolateral corner with 5-12 (n=11) small setae. Labia with apical microtrichia. Seminal capsules almost spherical in shape, about 1.5 times length of cerci. Spermathecal ducts proximally extensively lined with special secretory cells.

#### Pupa (n=10).

Length about 6 mm. Colour light brown; conjunctives darker, II/III to VI/VII medially with small brown patches.

Cephalothorax. Thoracic horn (Fig. 5) anterior edge curved; horn length 365 (320-400)  $\mu\text{m}$ , width 137 (110-150)  $\mu\text{m}$ , length/width 2.7 (2.4-3.2); ostia 29 (21-32); plastron plate length/width 2.0 (1.6-2.2); rim narrow; length ratio plastron plate/horn 0.43 (0.32-0.50); respiratory atrium obliquely T-shaped, longitudinal part without meander bends or diverticula, its width up to about 0.2 of horn width in corresponding section, atrium distal transverse part ("horn sac" sensu Coffman 1986, nec Fittkau & Murray 1986) little wider than longitudinal part, blind ends reaching beyond plastron plate, not significantly recurved. Anterodorsal thorax granulation usually limited to just anterior of very weak thorax comb, occasionally another small patch near anteprenotal region; granulation tubercles small, up to 4  $\mu\text{m}$  high, somewhat pointed. Three dorsocentral setae, their shapes and proportions as in Fittkau (1962: fig. 178).

Abdomen. Armament (Fig. 4) dense, including many bifid or multibranching spines about 4-6  $\mu\text{m}$  long; T VIII armament medially

**Tab. 1.** Segment lengths of *Conchapelopia hittmairorum*, spec. nov. (in  $\mu\text{m}$ ; ♂♂: left: small paratype / right: holotype; ♀♀: one complete animal from either end of body size range).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	
♂♂	p <sub>1</sub>	1205/1250	1445/1540	1190/1265	625/700	435/460	305/330	150/170
	p <sub>2</sub>	1270/1355	1210/1350	685/790	340/365	275/280	230/230	125/125
	p <sub>3</sub>	1165/1240	1575/1770	1125/1260	670/725	485/525	315/320	145/150
♀♀	p <sub>1</sub>	1155/1250	1430/1560	1140/1260	620/655	400/450	275/315	150/165
	p <sub>2</sub>	1265/1385	1290/1400	745/855	395/412	285/300	220/240	125/135
	p <sub>3</sub>	1090/1220	1570/1745	1070/1220	640/670	480/485	290/315	140/160

varyingly interrupted by longitudinal bare patches. Taeniae I-VI: 0; VII: 4; VIII: 5 (4). Anteriormost taenia on VII at 0.58 (0.49-0.61) of segment length from base, on VIII at 0.51 (0.42-0.51). Anal lobes (Fig. 3) strongly swollen medially, with a sclerotized structure near their juncture. Proximal anal lobe taenia at 0.45 (0.41-0.45) of lobe length from base, distal taenia at 0.55 (0.54-0.58). Male genital sac reaching to 0.59 (0.57-0.63) of anal lobe length.

#### Fourth instar larva (n=5).

Length about 8 mm. Colour of body yellowish white.

Head capsule length 740-810  $\mu\text{m}$ . Locations of cephalic setae as described for the genus in Rieradevall & Brooks (2001).

Antenna (Fig. 6). Length 335-375  $\mu\text{m}$ , 2.6 times length of mandible; AR 3.7-4.3; basal segment length 264-305  $\mu\text{m}$ ; segment lengths 2-4 combined 68-71  $\mu\text{m}$ , proportions 2:3:4 = 8:1.4:1; blade length 56-58  $\mu\text{m}$ .

Mandible (Fig. 8). Apex dark brown. Seta subdentalis recessed in a groove and difficult to discern. Lateroventral margin with seta 1 short, peg-shaped; seta 2 long, simple; seta 3 generally 3- to 4-branched.

Maxilla (Fig. 7). Basal segment of palp about 3.8 times as long as wide, ring organ 0.75 from base; b-seta (sensu Roback 1981 and Fittkau & Roback 1983, nec Sæther 1980) 22-26  $\mu\text{m}$  long; longest seta of palp 45-48  $\mu\text{m}$ .

Ligula (Fig. 9) with apical  $\frac{1}{2}$  brown. Pecten hypopharyngis with about 13-18 teeth on each side (Fig. 9).

Abdomen. Setae more than half as long as corresponding segment. Anal tubules conical, 230-260  $\mu\text{m}$  long, about 3.6 times as long as basal width. Procercus length/width 2.1-3.1. Posterior parapod with an area of fine points on distal  $\frac{1}{4}$ ; subbasal seta simple.

**Distribution and biology.** Since the known records of *C. hittmairorum*, spec. nov. range from Scotland (P. H. Langton, pers. comm.) and Sweden south to Spain (Langton, pers. comm.), the species is regarded as widely spread in Europe. Immature stages of *C. hittmairorum* have been found from the lower rhithral to upper potamal regions of summerwarm, mesosaprobic rivers (e.g. Moog 1995, Hieber 1985, Gmelch 1986), as exemplified by the new species' type locality on the river Alz. The Alz originates as the out-

let of Chiemsee, the largest lake in Bavaria with a surface area of approx. 80 km<sup>2</sup>, and joins the river Inn 63 km downstream. Within the collecting area it flows through diluvial gravels from the Würm period. Water temperature and discharge are largely determined by conditions in Chiemsee and by the continuous diversion of most of the river flow for the generation of electric power. The latter results in an average river discharge volume of only 12.5 m<sup>3</sup>/sec. The water temperature is relatively high in summer and low in winter. The Alz is a fast-flowing river with a stone/gravel substratum of mainly limestone of alpine origin. The average depth in the study area ranges between 0.5 and 1 m. The trophic status has been classified as  $\alpha$ -mesosaprobic (Wasserwirtschaftsamts Traunstein 1997).

Adults or exuviae have been collected from mid April through to late October. Adults reared (see "Methods" above) from larvae collected in the river Alz in February or March began to emerge in mid April. Five out of thirty-eight successful rearings resulted in intersex specimens.

#### *Conchapelopia pallidula* (Meigen, 1818)

Figs 11-13, 22

- Tanytus pallidulus* Meigen, 1818: 65 – adult female.  
*Pelopia costalis* Kieffer, 1911: 17 – adult female.  
*Pelopia muscicola* Kieffer, 1913: 12 – adult male; Thienemann (1912a: 35, 39; 1912b: 69) – nomina nuda.  
*Ablabesmyia bipunctella* Goetghebuer, 1932: 288 – adult male.  
*Ablabesmyia debeauchampi* Gowin, 1941: 291 – adults, pupa, larva.  
*Conchapelopia pallidula* (Meigen); Fittkau (1957: 317) – type species designation; Fittkau (1962: 236), in part – adults, pupa, larva; Langton (1991: 34), in part – pupa in key.

**Neotype fixation.** Meigen's description of *Tanytus pallidulus* is too brief to allow recognition of the species. It treats only the adult female ("Weibchen"; there is no evidence of a printing error), and it was based on a single specimen as is evidenced by the statement: "Der Rückenschild war durch den Nadelstich ganz verdorben; ich weiß also nicht ob er Zeichnungen hat" (The scutum was entirely spoiled by the pinning; thus I do not know whether it has markings). On Meigen's color plates – never



published by their author, specific preparation dates unknown – *T. pallidulus* is only represented as a male (see Morge 1975: pl. XI, fig. 11), whereas both sexes are depicted for many other species. That illustration also differs from the original description regarding pigmentation of the wing. In the Meigen collection at MNHN, the series under *T. pallidulus* consists of one female and one male. Both have most of the thorax quite intact, notably the vittae the color of which is slightly darker than the surrounding scutum, therefore disagree with Meigen's statement quoted above. The wings of both specimens, and the abdominal pattern of the male, also differ from Meigen's color plate. The above evidence suggests that neither of the two "*T. pallidulus*" in the Meigen collection of 1839 (unpublished MNHN accessions list) is an original (1818) specimen.

Goetghebuer (1923) examined the MNHN male, and later (beginning with Goetghebuer 1927) implicitly used it as reference for his concept of *T. pallidulus* (see "Background" under *C. triannulata* below). However, a formally acceptable neotype recognition was never published; "Type" inscriptions on the MNHN male slide – one each by Goetghebuer and Fittkau – are invalid.

In the only other known collection of Meigen Chironomidae, at Naturhistorisches Museum Vienna from where J. Megerle had sent the original material (Meigen 1818), no Meigen specimen of *Tanypus pallidulus* has been found. Most of the Megerle collection was lost in a fire in 1848 (R. Contreras-Lichtenberg, pers. comm.).

The above-demonstrated lack of original type material for *C. pallidula* (Meigen) – the type species of *Conchapelopia* – and the separation now of two species which were previously partially subsumed under *C. pallidula* together justify the present designation of a neotype in order to clarify taxonomic status.

Neither of the two MNHN Meigen specimens can reasonably be selected as neotype. Although some of the material included in *C. pallidula* by earlier workers is placed in other species below, a well-defined concept – pertaining to several life stages – has been in use for *C. pallidula* at least since Fittkau (1962). The MNHN male is of a different species (*C. triannulata*; see below), its selection would thus result in a significant loss of nomenclatorial stability. The MNHN female according to the

present species concepts is most likely *C. pallidula*, but is missing the genitalia and can not be definitively identified at this time (see sections "Diagnosis" under *C. hittmairorum*, spec. nov., and below).

For these reasons, a complete rearing of an adult male is here designated and diagnosed as neotype for *C. pallidula* (Meigen). Where applicable, the specimen is reasonably consistent with the morphological features originally described by Meigen. The darkened band across the beginning of the distal wing half is continuous, not divided into an anterior and a posterior area as Meigen described it. However, the setae producing the wing pattern are easily rubbed off, and Meigen later placed in the same species a specimen with a continuous wing band (see Morge 1975). The selection of a neotype from the southeast corner of Germany is placing the new type locality as near as practicable to the original one (Austria).

**Synonyms.** Several species have been regarded as synonyms of *C. pallidula* (see, e.g., Ashe & Cranston 1990). The synonymy listed above is based on the following type recognitions and examinations (details see "Material examined"). For *P. costalis* Kieffer (adult female described) and *P. muscicola* Kieffer (adult male) no specimens could be found in the 'Types de Kieffer' collection at IRSN or any other depository of Kieffer types. However, in accordance with Opinion 1147 of the International Commission on Zoological Nomenclature (1980) one pupal exuviae each from the A. Thienemann collection at ZSM are here considered integral parts of the respective original types. Individual associations with Kieffer's adults are verified by matching specimen label entries to records in the literature (e.g., Zavřel & Thienemann 1919: 714), in the original determination correspondence between Thienemann and Kieffer (at ZSM; see Spies 2001), and in Thienemann's working register of species (at ZSM). The morphological characteristics of these type exuviae confirm synonymy with *C. pallidula* in both cases.

*A. bipunctella* Goetghebuer was described from 3 adult male syntypes collected at Virton, Belgium, on 21.VII.1930 (Goetghebuer 1932). The only IRSN specimen labeled "Type" is from Virton, but dated 12.VII.1921. A second pin received from IRSN held a male hypopygium in a Goetghebuer-style celluloid mount, but no

other parts or source data, and the hypopygial features do not exactly match Goetghebuer's (1932) figure. Type status is thus in doubt for both of these specimens. However, since all available Goetghebuer material of *A. bipunctella* is consistent with the present concept of *C. pallidula*, the junior synonymy of *A. bipunctella* is here upheld.

Ample alcohol-preserved material and possibly also slides of F. Gowin's (or Gouin's) are reportedly preserved at the Musée Zoologique in Strasbourg, France (J.-C. Delécolle, pers. comm.), but no types of *A. debeauchampi* nor a confirmation of their existence could be obtained for the present study. At ZSM there are several specimens in this name collected by Gowin at one of the two type localities (Lunz, Austria), but all labels are by Thienemann who had met Gowin during that sampling period (Thienemann field notes at ZSM). Although it is not certain that this material was used for Gowin's publication, all specimens seen are consistent with *C. pallidula*. Therefore, *A. debeauchampi* is here maintained as a junior synonym of *C. pallidula*, pending possible evidence from the Gowin collection.

The holotype of *A. puncticollis* Goetghebuer in Thienemann, 1936 (IRSN), an adult female, can not be definitively identified at this time (see comments in "Diagnosis" under *C. hittmairorum*, spec. nov.). Fittkau (1962) based the synonymy under *C. pallidula* in part on Zavřel's (1936) description of a pupal exuviae of (*A.*) "*puncticollis* Goetghebuer". A female exuviae in the Zavřel collection (MUB) is labeled "*puncticollis* Gtg" and "1935", and agrees with Zavřel's description and illustration (op. cit.: fig. 2C). This specimen belongs to *C. triannulata* (Goetghebuer), described below. The only source data on the slide are the entries "147b" (for *A. puncticollis*) and "163a" (for a second exuviae, *A. "hieroglyphica"*). These can be interpreted as Thienemann sample codes, as the "163a" leads to matching data in a Thienemann field notebook at ZSM and in Zavřel (1936: 319; "Tuffbach in 750 m, 16.VII.35"). However, the "147b" for *A. puncticollis* leads to a sample different from the one Thienemann (1936) and Zavřel (1936) gave as the source of Goetghebuer's holotype ("Wiesenbach ..., 26.VII.35" = "184b" in Thienemann field book). Consequently, with the holotype female indeterminable and the association of the exuviae in doubt, *A. puncticollis* Goetg-

buer must be treated as a nomen dubium in *Conchapelopia*.

#### Material examined

1. DESCRIBED. Neotype: M+Pe+Le, on 1 slide, in Euparal, deposited at ZSM; GERMANY, Bavaria, river Alz, Hohenwardt, 48°12' N 12°46' E, 390 m a.s.l., 21.III.1998, leg. S. Michiels. As neotype except: 22.VIII.1997: 1 F+Pe+Le; 4.I.1998: 2 F+Pe+Le; 14.II.1998: 1 F+Pe+Le; 21.III.1998: 2 M+Pe+Le; river Salzach, Burghausen, S. Michiels, 10.VIII.1997: 1 F+Pe+Le; 26.X.1997: 1 F+Pe+Le; 19.IV.1998: 1 M+Pe+Le; 9.V.1998: 2 M+Pe+Le (ZSM and coll. Michiels).

2. ALSO DETERMINED.

2A. TYPE MATERIAL: *P. costalis* Kieffer: 1 female Pe (ZSM), part of holotype; GERMANY, Westphalia, hatched 9.V.1910, C. Rhode. *P. muscicola* Kieffer: 1 male Pe (ZSM), part of holotype; GERMANY, Westphalia, Sauerland, Hasperbach, 17.VII. (emerged 24.VII.)1911, A. Thienemann. *A. debeauchampi* Gowin: 1 phM in Pe, 1 Pe (ZSM); syntype status uncertain; AUSTRIA, Lower Austria, Lunz, Seebach, spring 1941, F. Gowin. *A. puncticollis* Goetghebuer: holotype F (IRSN); GERMANY, Bavaria, nr Garmisch-Partenkirchen, meadow stream behind Werdenfelser Hütte, 26.VII.1935 (not "VIII" as in Thienemann 1936), A. Thienemann.

2B. NON-TYPE MATERIAL. AUSTRIA, Niederösterreich (ZSM unless stated): Hainfeld, ex coll. J. Mik, 12.IX.1892: 1 M (IRSN); Lunz, Untersee, A. Thienemann: 9.VIII.1940: 2 Pe, 20.VIII.1940: 1 Pe; Schneimbach, Gries, 28.VI.1973, H. Malicky: 2 M, 1 F; Schiefaugraben, Randegg, 20.VII.1973, H. Malicky: 1 M; Schauboden, Erlafschlucht, 12.VIII.1973, H. & R. Rausch: 3 M; Kemmelbach, Wechling, 17.VII.1973: 1 M; Kärnten, Feistritz, 24.X.1979, H. Malicky: 1 M. BELGIUM (IRSN): Virton, 12.VII.1921, M. Goetghebuer: 1 M (labeled "*Ablabesmyia bipunctella* Goetgh." and "Type", but see "Synonyms" above). GERMANY (ZSM unless stated): Nordrhein-Westfalen: Hundembach, 14.IX.1909, A. Thienemann: 2 Pe; river Ruhr nr Freienohl, VIII-IX.1911, A. Thienemann: 1 Pe; Sauerland, Hälverbach nr Schalksmühle, II.1910, A. Thienemann: 2 Pe; Sauerland, leg. Dittmar: 1 M+Pe, 1 M; Rheinland-Pfalz, Eifel, Daun, 30.VII.1957, I. Müller-Liebenau: 1 M; Hessen, river Fulda, E. J. Fittkau: Wasserkuppe: 3 M; Obernhaus, 5.X.1952: 1 M+Pe; Erlenwald: 1 M; "Fulda-EAW", 7.VII.1952: 1 Pe; 1.X.1952: 1 M(hypop.)+Pe; 1952: 1 M, pts of 4 Pe; "Fulda III", VII.1952: 2 M; VI-VII.1953: 2 M(hypop.); 29.VII.1953: 1 phM+Pe; Baden-Württemberg, Schwarzwald, Schwarza (stream), leg. Hauer-Eichhardt: 1 M+Pe, 1 F+Pe; Bodensee, Maurach, 13.VI.1962, F. Reiss: 1 Pe; Bayern, Kempten, Eichholz-Schorenmoos, 20.-27.VIII.1974, H. Mendl: 1 M; river Amper, Schöngesing, 3.VI.1987, E. Hieber: 1 Pe; river Würm, 3.VI.1987, E. Hieber: 1 Pe; Tegernsee, nr E

shore, 31.V.1990, N. Reiff: 1 Pe; river Isar, Grünwald, 24.VI.1991, B. Schröder: 1 Pe; river Salzach, Burghausen, S. Michiels (coll. Michiels), 16.VI.1996: 2 Pe; 18.VIII.1996: 2 Pe; 10.VIII.1997: 1 M+Pe+Le; 21.VIII.1997: 1 M+Pe; 22.II.1998: 1 F+Pe+Le; 9.V.1998: 1 F+Pe+Le. Bavaria, river Alz, Hohenwardt, S. Michiels (coll. Michiels), 11.V.1997: 1 F+Pe; 4.I.1998: 1 M+Pe+Le, 1 F+Pe+Le; 14.II.1998: 1 F+Pe+Le; 21.III.1998: 1 M+Pe+Le, 1 phM+Pe+Le, 1 F+Pe+Le. GREECE: Lesbos, 1 km W Ippion, 24.V.1975, H. Malicky: 1 P. GREAT BRITAIN (all leg. G. H. Verrall, at BMNH): England, Derbyshire, Dovedale, 8.VI.1888: 1 M; 9.VI.1888: 1 M. Wales, Merioneth, Dolgelly, 22.VII.1888: 1M. SPAIN: Castilla, Picos de Europa, 1953, leg. Bertrand: 1 Pe. ORIGIN UNKNOWN: 1 F ex coll. Meigen (MNHN), see "Synonyms" above. 1 M(hypop.) ex coll. Goetghebuer (IRSN), sub *A. bipunctella* but see "Synonyms" above.

**Diagnosis.** For characters distinguishing the adult male see the corresponding section under *C. hittmairorum*. Among the species and specimens studied here, associated adult females of *C. pallidula* were distinguished only by the combination of: preepisternal setae absent; pulvilli minute, indistinct; wing length < 3.05 mm; vertical setae 14-15; prealar setae less than 40; supraalar setae 3;  $LR_1 > 0.65$ . However, see "Diagnosis" under *C. hittmairorum*, spec. nov. The pupa of *C. pallidula* (Meigen) is separable from other *Conchapelopia* only by the characters given in the key.

## Description

Indistinguishable from *C. hittmairorum*, spec. nov. except as follows. Data presented as: neotype (other associated specimens), where applicable.

### Adult male (n=7).

Wing length 2.93 (2.28-2.94) mm.

Coloration. Median and usually also lateral vittae with anterior ends brown. Brown patches on supraalar callus, median anepisternum, and on anterior anepisternum near anapleural

suture. But pigmentation can be reduced. Wing pigmentation as in *C. hittmairorum*. Abdomen: T VII brownish in anterior 1/2, T VIII with anterolateral brown patches.

Head. AR 1.98 (1.74-2.02).

Thorax. Acrostichals 65 (52-65), supraalars 3, scutellars 62 (44-59).

Legs. Tibial spurs with 9-12 side teeth; spur length on fore ti 53 (41-54)  $\mu$ m, on mid ti 68 (53-68) and 77 (58-77)  $\mu$ m, on hind ti 59 (48-59) and 96 (80-97)  $\mu$ m.  $BR_1$  7.3 (4.5-7.6); tarsomere 3 of mid leg with apical tuft of setae. Segment lengths are given in table 2.

$LR_1$  0.85 (0.78-0.87),  $LR_2$  0.58 (0.56-0.64),  $LR_3$  0.70 (0.67-0.74).  $BV_1$  2.50 (2.51-2.68),  $BV_2$  3.20 (3.14-3.40),  $BV_3$  2.42 (2.41-2.60).

Hypopygium. Tergite IX setae 20 (13-24), including 5/6 (3-6) on each ridge end. Median volsella length 148 (121-141)  $\mu$ m, combined basal width 100 (86-106)  $\mu$ m, length/basal width about 1.49 (1.30-1.41); anterolateral corner of volsella with short but distinct projection to lateral; dorsolateral edge somewhat sinuous (Fig. 22), with row of 19 (17-22) lateral processes, the latter strongly expanded subapically and bent rectangularly to anteroventral.

### Adult female (n=5).

Total length about 3.4 mm, wing length 2.28-3.02 mm.

Pigmentation of thorax and wing as in male, but generally stronger and rarely reduced (except for spot on median anepisternum); abdomen pale.

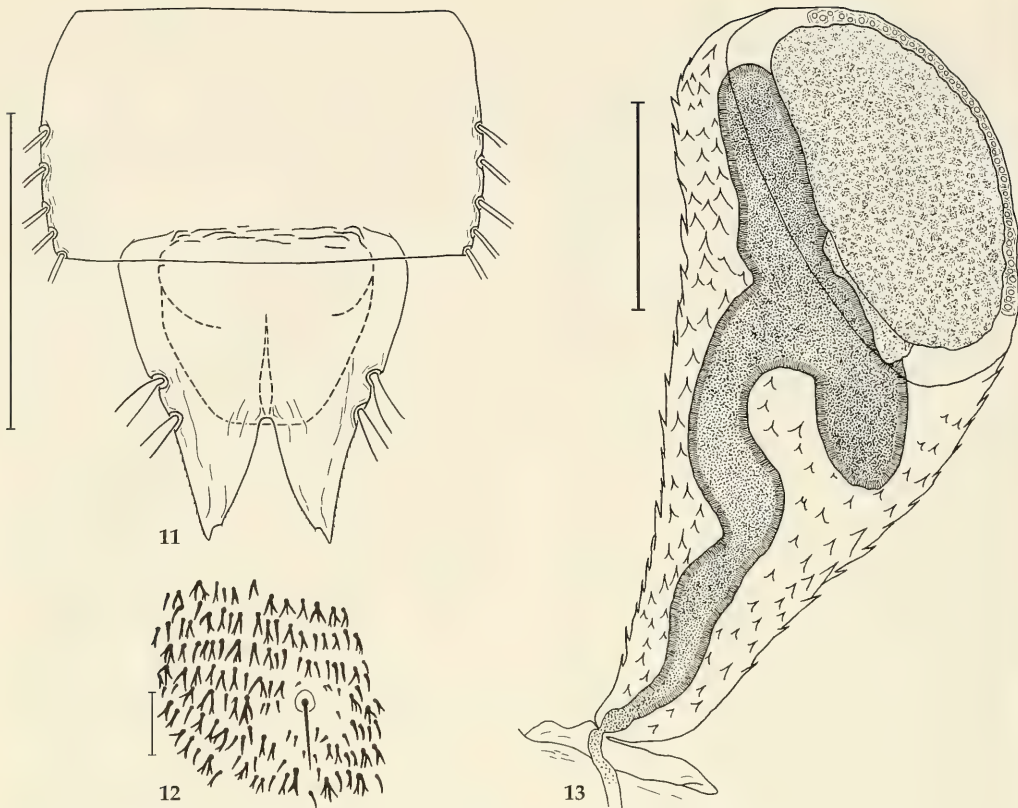
Head. AR 0.28-0.32; scapus setae 3-5, pedicel setae 8-10. Temporal setae 22-24, including 14-15 partially biserial verticals and 7-9 postorbitals. Clypeus with 24-41 setae.

Thorax. Anteprenotal setae (n=10): 0-1 median, 3-9 lateral; acrostichals 57-76, dorsocentrals and humerals combined 42-65, prealars 29-38, preepisternals 0, supraalars 3; scutellars 55-78.

Genitalia as in *C. hittmairorum*, spec. nov.

**Tab. 2.** Segment lengths of *Conchapelopia pallidula* (Meigen, 1818) (in  $\mu$ m; left: small specimen / right: neotype).

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>
$\delta\delta$							
p <sub>1</sub>	960/1310	1155/1545	1010/1315	480/685	330/470	245/335	130/180
p <sub>2</sub>	1005/1340	960/1380	615/810	290/400	230/305	190/255	115/145
p <sub>3</sub>	895/1260	1360/1765	1005/1240	510/710	390/540	255/345	130/165



**Figs 11-13.** *C. pallidula* (Meigen); pupa. **11.** Abdominal segments VIII, IX; scale bar: 500  $\mu\text{m}$ . **12.** Tergite VII: seta  $D_2$  and armament; scale bar: 20  $\mu\text{m}$ . **13.** Thoracic horn; scale bar: 100  $\mu\text{m}$ .

#### Pupa (n=10).

**Cephalothorax.** Thoracic horn (Fig. 13) anterior edge straight; length 385 (341-387)  $\mu\text{m}$ , width 167 (140-189)  $\mu\text{m}$ , length/width 2.3 (2.0-2.4); ostia 39 (13-31), plastron plate length/width 1.8 (1.5-1.9); length ratio plastron plate/horn 0.45; respiratory atrium obliquely T-shaped, longitudinal part occasionally more or less curving and/or with short diverticula, its width up to about 0.3 of horn width in corresponding section, atrium distal transverse part little to moderately wider than longitudinal part, blind ends not always reaching beyond plastron plate, in some cases recurved. Anterodorsal thorax granulation extending from anteprenotal region to weak thorax comb; many granulation tubercles large, up to 8  $\mu\text{m}$  high.

**Abdomen.** Armament (Fig. 12) composed of single to bifid, sometimes multibranching, robust spines about 8  $\mu\text{m}$  long.

Anal lobes medially more or less straight, not distinctly swollen (Fig. 11).

#### Fourth instar larva (n=4).

Head capsule length 790-870  $\mu\text{m}$ . Otherwise indistinguishable from *C. hittmairorum*.

**Distribution and biology.** Any previous account of *C. pallidula* (Meigen) – e.g., Fittkau (1962), Fittkau & Reiss (1978), Ashe & Cranston (1990), Sæther et al. (2000) – may be based at least in parts on *C. hittmairorum*, spec. nov. and/or *C. triannulata* (Goetghebuer). Nevertheless, since *C. pallidula* (Meigen) is here confirmed from Great Britain, Belgium, Germany, Austria, Spain, and Greece, the species is probably distributed throughout Europe.

Its larvae are apparently rheophilic, but also occur in spring stream and lake littoral habitats. Their temperature tolerance range is relatively wide: at the summerwarm river Alz site (see

“Distribution and biology” under *C. hittmaiorum*, spec. nov.) *C. hittmaiorum* and *C. triannulata* were also present, but in the nearby, summercold river Salzach *C. pallidula* was the only one of the species studied here (Michiels 1999).

Adults or exuviae have been collected from mid April through late October. Adults reared (see “Methods”) from larvae collected in winter began to emerge in mid April. The two Pe from “Hälverbach, II.1910” are, according to Thienemann’s standard methods, assumed to have resulted from rearing at room temperatures.

### *Conchapelopia triannulata* (Goetghebuer)

Figs 14-18, 24

*Tanypus triannulatus* Goetghebuer, 1921: 69-70, 187 – adult male.

“*Tanypus pallidulus* Megerlé”; Goetghebuer (1923: 121) – adult male ex coll. Meigen (MNHN).

“*Tanypus pallidulus* Meig. (Edw.)”; Goetghebuer (1927: 49/50, fig. 44q), in part – adult male, synonymisation of *T. triannulatus*.

*Ablabesmyia pallidula* (Meigen); Goetghebuer in Goetghebuer & Lenz (1936: 25, 29, 36, pl. IV: fig. 51), in part – adult male, female.

*Pentaneura (Ablabesmyia) puncticollis* Goetghebuer; Zavřel (1936: 320) – pupa (see “Synonyms” under *C. pallidula* above).

**Background.** Goetghebuer (1921) described the adult male of *Tanypus triannulatus* as possessing bands on abdominal tergites III-V only (hence the species name), and as lacking wing markings. The number of specimens was not given, but his listing of two Belgian localities (op. cit.: 187) implies the existence of syntypes.

No material labeled “*T. triannulatus*” by Goetghebuer could be found in any collection. However, a male at IRSN does match the original description and sample information. It is labeled “*pallidula*”, but is clearly different from that species. This label is interpreted as a later addition, since an obviously older one dates the specimen from 1919, well before Goetghebuer (1921) in which *C. pallidula* was not listed among the species then known from Belgium.

Goetghebuer (1923) recognized the male under “*T. pallidulus*” in the Meigen collection as “entirely similar” to *T. triannulatus*. Misinterpreting (but not establishing!) the Meigen specimen for a type of *T. pallidulus* (see “Neotype fixation” under that species), Goetghebuer (1927) synonymized the two species. However,

his morphological concept for this taxon remained unchanged, as all of his treatments repeat the abdominal pattern of *T. triannulatus*, with T VIII and sometimes also T VI pale (Goetghebuer 1927: fig. 44q, Goetghebuer & Lenz 1936: pl. IV, fig. 51). Although this was noted by Fittkau (1962) to disagree with the concept of *C. pallidula* used by most authors other than Goetghebuer, the synonymy was upheld while type material remained unavailable and/or insufficiently examined.

The present authors deem it justifiable, and beneficial to nomenclature, to recognize the 1919 male at IRSN as a syntype of *C. triannulata* (Goetghebuer). Thereby, the species to be separated from *C. pallidula* as defined below can take an available, recently unapplied name – instead of requiring an additional, new one if *Tanypus triannulatus* was treated as yet another nomen dubium.

### Material examined.

1. DESCRIBED. Syntype: M, on slide, in Euparal, at IRSN; BELGIUM: “Hockay, 11.7.19”, “Collection M. Goetghebuer”, “169” (sample or coll. No.?). GERMANY, Bavaria, river Alz, Hohenwardt, S. Michiels. 14.II.1998: 2 M+Pe+Le, 1 F+Pe+Le; 21.III.1998: 1 M+Pe+Le, 3 F+Pe+Le. ORIGIN UNKNOWN: ex coll. Meigen (MNHN): 1 M, see “Background”.

2. ALSO DETERMINED. AUSTRIA, Niederösterreich (at ZSM): Schiefaugraben, Randegg, 20.VII.1973, H. Malicky: 1 M; Kammelbach, Wechling, 17.VII.1973, H. Rausch: 2 M; Schauboden, Erlafschlucht, 12.VIII.1972, H. Rausch: 1 M. FRANCE: eastern Pyrenées, Nohides, 11.X.1994, J. Moubayed: 1 pHM+Pe (PHL); Aude, Etang de Gruissan, 7-10.VI.1980, W. Schacht: 3 M (ZSM); Provence, Montagne de Lure, Lauzon nr Cruis, 500m a.s.l., 14.VI.1980, W. Schacht: 1 M (ZSM). GERMANY (at ZSM unless stated): Rheinland-Pfalz, Hunsrück mts, Baybach, 26.VIII.1996, S. Michiels: 1 Pe (coll. Michiels); Hessen, river Fulda, “EAW”, 14.VIII.1952, E. J. Fittkau: 1 Pe; river Fulda, “Nr. 77”, J. Lehmann: 1 M, 2 Pe; Bayern, Simmelberger Gründlach, Heroldsberg, 18.V.2000, C. Orendt: 1 Pe (coll. Michiels); Steinebach am Wörthsee, rheokrene E of train station, 10.VI.1992, R. Gerecke: 1 M+Pe; Schöngesing nr Munich, Spiessellaichwiesen, 3.VI.1985, W. Schacht: 1 M; Schöngesing, Kellerbach, W. Schacht, 28.VI.1992: 1 M; 24.VII.1992: 1 M; Eichenau nr Munich, Starzelbach, 10.V.1998: 3 Pe, 4.VII.1998: 3 Pe; Puchheim nr Munich, gravel pit pond, F. Reiss, 14.IX.1990: 1 Pe, 21.VIII.1991: 1 Pe; Puchheim nr Munich, Herbststr. 10, 12.VIII.1997, F. Reiss: 1 M; Aubinger Lohe nr Munich, E. Diller, 25.VII.1978: 1 M, IX.1978: 1 M; Langwieder Bach at railroad tracks, 12.V.1995, F. Foeckler: 1 M; river Würm, Lochham, 16.VIII.

1984, G. Wyrwa: 1 Pe; Würm floodplain nr Locham, 5.VII.1977, F. Reiss: 1 M from swarm; nr Garmisch-Partenkirchen, spring seep on way to Hammersbach, 11.VII.1935, A. Thienemann: 1 Pe (sub "*A. puncti-collis*", see "Synonyms" under *C. pallidula*; coll. Zavřel, MUB); Tegernsee, East shore, 31.VII.1990, N. Reiff: 2 Pe; Chiemsee, E shore, Aiterbacher Winkel, 30.VIII.1988, N. Reiff: 1 Pe. GREAT BRITAIN, England: Kent, river Darent, Otford, 28.III.1976, P. S. Cranston: 1 L+P+phM (BMNH); Staffordshire, river Churnett, Oakamoor, 26.V.1985, P. H. Langton: 1 M+Pe (PHL). GREECE (ZSM): Korfu, leg. H. Malicky: 1 M intersex; Crete, H. Malicky: 2 M; as prev. exc. Protaria, 15.V.1971: 1 M. ISRAEL: Jordan-park N Kineret, 6.IV.1987, G. Müller: 1 M at light; Snir, 8.IV.1987, G. Müller: 1 M (ZSM). SLOVAKIA: river Slatina, Bratislavský most, Veporské vrsky mts, 590 m a.s.l., 2.VIII.1989, P. Bitušik: 1 Pe. SPAIN: Teruel, Sierra de Albarracín, Noguera, 1600 m a.s.l., 3.-6.VIII.1980, W. Schacht: 1 M (ZSM). TURKEY: Adiyaman, Celik Gölü, 900 m a.s.l., Gölbasi, 21.VI.1985, W. Schacht: 1 M (ZSM); Kars, Soganli 30 km W Sarikamis, 2100 m a.s.l., 1./2.VIII.1983, W. Schacht: 1 M; Aras valley W Karakurt, 1300 m a.s.l., 4.VII.1985, W. Schacht: 1 M; Beyobas, 28°47' E 36°54' S, 24.V.1992, H. Malicky: 1 M.

**Diagnosis.** The male hypopygium (median volsella with distinct, microtrichiose ventral lobe) is similar to those of *C. viator* (Kieffer) and *C. trifascia* (Freeman), but *C. triannulata* lacks preepisternal setae (present in both those species), wide and plumose pulvilli (present in *C. viator*), subbasal tibial bands and a darkened crossvein region on the wing (*C. trifascia*). The species most similar to *C. triannulata* is the Afrotropical *C. zairensis* Lehmann, 1979. The latter has a very similar hypopygium, and also lacks preepisternal setae and wide pulvilli. However, the type material of *C. zairensis* (at ZSM) shows that its pigmentation pattern is very similar to that of *C. trifascia*, including a thorax much more extensively darkened than in *C. triannulata*, subbasal tibial bands, a partially darkened abdominal TVIII, and – contrary to Lehmann's (1979) description – a patterned wing with distinctly darkened crossvein region.

Among the species and specimens studied here, associated adult females of *C. triannulata* were distinguished only by the combination: preepisternal setae absent; pulvilli minute, indistinct; wing length > 3.05 mm; vertical setae at least 20; prealar setae at least 45; supraalar setae 3;  $LR_1 < 0.65$ . However, see "Diagnosis" under *C. hittmairorum*, spec. nov.

The pupa of *C. triannulata* can be separated from other *Conchapelopia* only by the characters given in the key.

## Description

### Adult male (n=4-5).

Measurement data are presented as: syntype (associated Alz specimens).

Total length about 5 mm, wing length 2.72 (Meigen male: 2.56, Alz: 2.98-3.19) mm.

Pigmentation variably developed, some markings indistinct on pale (?teneral) specimens (e.g., syntype), darkest condition as follows: all vittae with brown anterior ends, median vittae occasionally also with posterior brown band. Supraalar callus also brown; median anepisternum anterodorsally brown, anterior anepisternum with longitudinal streak above anterior end of anapleural suture; legs pale; wing as in *C. hittmairorum*; abdomen as in Fig. 14 (but bands on tergites often indistinct on dried specimens, on T VI of syntype pale even after maceration), T VII brownish in anterior  $\frac{1}{2}$ - $\frac{3}{4}$ , T VIII unpigmented.

Head. Temporal setae 16, 20 (21-26) uniseriate or medially biserial, including 12, 15 (13-16) verticals and 4, 5 (7-10) postorbitals. AR 1.87-1.96, antennae missing from syntype and Meigen male; pedicel with 6+1 (5-6+1) setae. Clypeus with 17 (23-33) setae. Palpomere length increasing from Pm1 to Pm5; Pm2 without "brush".

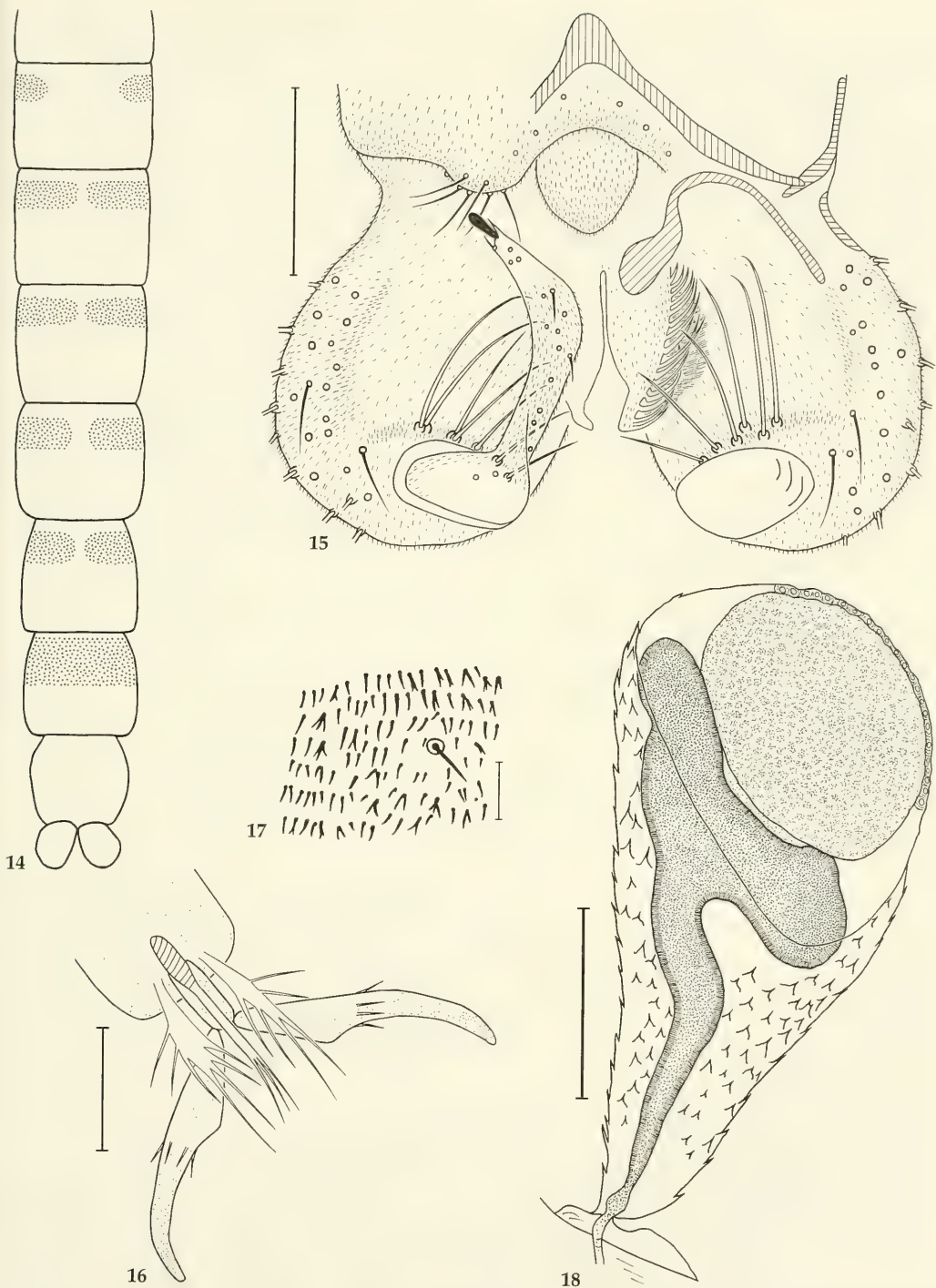
Thorax. Anteprenotal setae 11, 12 (5-9), all lateral; acrostichals 54 (56-73); dorsocentrals and humerals combined 29, 31 (39-45); prealars 16, 17 (19-35); preepisternals 0; supraalars 2 (2-3); scutellars 45 (48-52).

Wing. VR 0.90 (0.87-0.95). Squamal setae 33 (37-47).

Legs. Tibial spurs with 6-7 (6-10) side teeth; spur length on fore ti 42 (43-51)  $\mu$ m, on mid ti 62 (59-68) and 68 (59-81)  $\mu$ m, on hind ti 45 (49-61) and 80 (82-108)  $\mu$ m. Comb of hind tibia with 7 (6-8) spines. BR<sub>1</sub> approx. 5 (5-6.5); tarsomere 3 of mid leg with apical tuft of setae only indicated. Pulvilli narrow, with few projections (Fig. 16). Segment lengths are given in table 3.

$LR_1$  0.81 (0.81-0.84),  $LR_2$  0.56 (0.57-0.58),  $LR_3$  0.69 (0.63-0.67).  $BV_1$  2.66 (2.58-2.67),  $BV_2$  3.65 (3.21-3.37),  $BV_3$  2.62 (2.46-2.53).

Hypopygium (Fig. 15). Tergite IX setae 16 (20-24), including 4, 5 (5-8) setae on each ridge end. Median volsella length 98  $\mu$ m (105-118



**Figs 14-18.** *C. triannulata* (Goetghebuer). 14-16. Adult male. 14. Abdominal pigmentation, dorsal. 15. Hypopygium, dorsal; scale bar: 100  $\mu$ m. 16. Empodium, pulvilli, tarsal claws of hind leg; scale bar: 20  $\mu$ m. 17-18. Pupa. 17. Tergite VII: seta D<sub>2</sub> and armament; scale bar: 20  $\mu$ m. 18. Thoracic horn; scale bar: 100  $\mu$ m.

µm), combined basal width 64 µm (60-76 µm), length/basal width about 1.5 (1.5-1.75); antero-lateral corner of volsella rounded, not projecting to lateral, dorsal part of each volsella distally tapering to slightly enlarged apex, dorsolateral edge slightly convex, with row of 15 processes (10-14; those concentrated at apex not counted) which are curving to anteroventral and gradually tapered (Fig. 24); ventral part of volsella forming an extensive lobe (most obvious on macerated and compressed specimens) densely covered with microtrichia in curved row groups of 3-4 each. Gonocoxite with 4 (5-7) strong distal-dorsal setae and 1 (1-2) weaker median seta anterior to insertion of gonostylus. Gonostylus without distal-median tubercle or projection near origin of megaseta.

#### Adult female (n=4).

Identical to *C. hittmairorum*, spec. nov. except as follows.

Total length about 3.6 mm, wing length 3.08-3.26 mm.

Pigmentation of thorax and wing as in male, but generally stronger, posterior ends of median vittae more frequently pigmented.

Head. AR 0.24-0.27. Temporal setae 30-32, including 20-22 biserial verticals and 9-10 post-orbitals. Clypeus with 35-45 setae.

Thorax. Anteprenotal setae (n=4): 0-2 median, 7-16 lateral; acrostichals 82-98, dorsocentrals and humerals combined 61-74, prealar 45-60, preepisternals 0, supraalar 3, scutellars 65-83.

Wing. VR 0.93.

Legs. BR<sub>1</sub> 3.4-4.3. Tibial spurs 8-11 side teeth; spur length on fore ti 52-62 µm, on mid ti 62-74 µm and 70-82 µm, on hind ti 59-62 µm and 91-106 µm. Segment lengths are given in table 3.

LR<sub>1</sub> 0.77-0.80, LR<sub>2</sub> 0.55-0.59, LR<sub>3</sub> 0.61-0.64. BV<sub>1</sub> 2.58-2.66, BV<sub>2</sub> 3.43-3.60, BV<sub>3</sub> 2.49-2.55.

Genitalia as in *C. hittmairorum*, spec. nov.

#### Pupa (n=5).

Length about 6 mm. Colour as in *C. hittmairorum*, spec. nov.

Cephalothorax. Thoracic horn (Fig. 18) anterior edge straight, horn length 353-426 µm, width 171-201 µm, length/width 2.0-2.2; ostia 23-28; plastron plate length/width 1.4-1.7; rim narrow, length 1.3 times plastron plate; length ratio plastron plate/horn 0.38-0.48; respiratory atrium obliquely T-shaped, longitudinal part without meander bends or diverticula, its width up to about 0.25 of horn width in corresponding section, atrium distal transverse part wider than longitudinal part, blind ends reaching beyond plastron plate, not significantly recurved. Anterodorsal thorax granular from anteprenotum region to weak thorax comb, granulation of small irregular tubercles up to 4 µm high.

Abdomen. Armament (Fig. 17) dense, of single to bifid, sometimes multibranching, robust spines about 8 µm long. Anal lobes medially more or less straight, not distinctly swollen.

#### Fourth instar larva (n=4).

Head capsule length 850 µm. Otherwise indistinguishable from *C. hittmairorum*. Note that the associated larva reported as *C. viator* by Rieradevall & Brooks (2001) belongs here instead.

**Distribution and biology.** Compared to the other species studied here, the distribution area of *C. triannulata* appears to be shifted south toward the Mediterranean, but it also includes central Europe and England. The single Pe from Slovakia reported as *C. viator* in Bitušík (1993) instead is *C. triannulata*.

**Tab. 3.** Segment lengths of *Conchapelopia triannulata* (Goetghebuer) (in µm; ♂♂: left: syntype / right: large Alz specimen; ♀♀: one complete animal from either end of body size range).

		fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>
♂♂	p <sub>1</sub>	1200/1410	1470/1735	1190/1400	620/730	410/500	290/345	130/185
	p <sub>2</sub>	1240/1445	1190/1490	670/855	320/410	240/320	190/255	100/145
	p <sub>3</sub>	1150/1325	1620/1960	1110/1310	620/745	460/540	280/355	120/170
♀♀	p <sub>1</sub>	1325/1315	1670/1740	1320/1370	690/730	485/470	325/315	175/175
	p <sub>2</sub>	1525/1600	1560/1570	925/890	435/425	335/335	250/260	135/135
	p <sub>3</sub>	1325/1310	1965/2025	1260/1250	705/740	555/550	345/340	175/175



Immature specimens were taken mostly in running waters ranging from spring streams to small rivers, but also in a cold-water pond and the littoral of a prealpine lake. Adults or exuviae have been collected from from mid April through mid October. Adults reared (see "Methods") from larvae collected in the river Alz in February or March began to emerge in mid April.

### *Conchapelopia viator* (Kieffer, 1911)

Figs 19-21, 25

*Psectrotanypus viator* Kieffer, 1911: 8 – adult male.

*Pentaneura viator* (Kieffer); Edwards (1929: 293) – adult male in key.

*Conchapelopia viator* (Kieffer); Fittkau (1962: 247), in part – adult male; Langton (1991: 32) – pupa in key.

"*Conchapelopia* sp. Flesk"; Murray (1974: 178, but see p. 181) – pupa.

**Background.** The single type specimen of *C. viator*, an adult male collected by A. Thienemann inside a moving train in Sauerland, Germany, was apparently never studied by anybody but Kieffer, and has long been considered lost (Fittkau 1962). The original description is insufficient to recognize the species, or even the genus. No known *Conchapelopia* shows abdominal tergites with darkened posterior margins as described by Kieffer. On the other hand, the taxonomic concept using the epithet *viator* (Kieffer) has been largely consistent since Edwards (1929), and is deemed stable as diagnosed here. No single specimen available for the present study is sufficiently complete and in adequate condition to become the sole bearer of the species name. Consequently, a neotype designation is considered neither productive nor as necessary as required by the nomenclature Code (ICZN 1999).

#### Material examined.

1. DESCRIBED. CZECH REPUBLIC (ZSM): Bohemia, Lipno-"Lichtung" (probably clearings for the 1958 damming-up of river Vltava; P. Bitušík, pers. comm.), 4.VIII.1953, J. Lellák: 1 M and parts of another. GREAT BRITAIN (BMNH): Scotland, Argyllshire, Bonawe, nr Taynuilt, VIII.1919, J. Waterston: 1 M; England, Yorkshire, Helwith Moss, 28.VI-4.VII.1930, F. W. Edwards: 2 M; Wales, Caernarvon, Llyn Gwynant, 13.VII.1914, F. W. Edwards: 1 M; Wales, Denbighshire, Llangollen, 17.IV.1888, G. H. Verrall: 1 M; Wales, Merioneth, Dolgelly, 25.VII.

1888, G. H. Verrall: 1 M. IRELAND (coll. D. A. Murray, Dublin): Co. Kerry, Killarney, River Flesk, 1.VIII.1974 (adult hatched), D. A. Murray: 1 M+Pe. SPAIN: Galicia, La Coruña, Sierra del Barbanza, 11.VII.1988, F. Cobo: 1 phF+Pe (ZSM).

2. ALSO DETERMINED. AUSTRIA: Oberösterreich, Böhmerwald, Stift Schlägl, 2.VIII.1982, H. Malicky: 2 M (ZSM). FRANCE (both PHL): Alsace, Vosges, La Moselette, 27.VIII.1997, P. H. Langton: 1 Pe; Provence, Alpes Maritimes, R. Real Colobrier, 3.V.1994, J. Moubayed: 1 phM+Pe. PORTUGAL: Rio Minho, Monção, 10.VIII.1984, L. Whytton da Terra: 2 M (ZSM). SPAIN: Galicia, La Coruña, Rio Ulla, Fuentevea, 26.V.1991: 1 Pe (PHL); Prov. Cáceres (all leg. W. Schacht, ZSM), Rivera de Gata at Villasbuenas, 9-10.VII.1987: 2 M, 2 Pe (not assoc.), and 30-31.VI.1988: 1 M; Sierra de Gredos Cuacos, N Jaraiz, 1.VII.1988: 1 M; Prov. Cádiz, Hozgarganta valley, nr Jimena, 17.VII.1979, W. Schacht: 1 M (ZSM).

**Diagnosis.** In the species' verified distribution area, the western Palaearctic, adult males of *C. viator* (Kieffer) are distinguished by the following combination: preepisternum with setae, wing pale (only squama with dark patch); tibiae without pigment bands; pulvilli relatively wide and plumose; median volsella ventrally with microtrichiose lobe, volsellar lateral processes evenly tapered. Adult females also can be recognized by the presence of preepisternal setae and wide, plumose pulvilli. Pupae are characterized by the described shapes and proportions of thoracic horn, plastron plate and rim, by the form of the anal lobes and by the armament of the thorax.

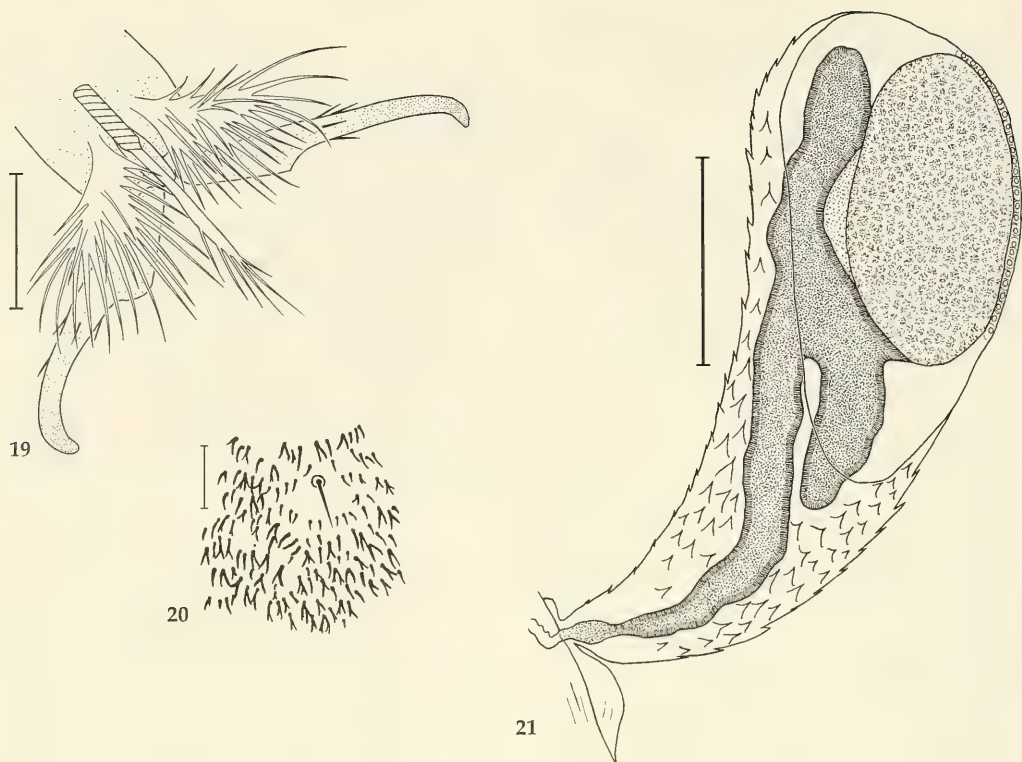
#### Description

##### Adult male (n=5-7).

Total length about 5 mm, wing length 2.70-3.12 mm (n=7).

Coloration. Thoracic markings (vittae, and parts of median anepisternum II, preepisternum, and postnotum) light brown, vittae without darker margins or sections. Legs pale. Wing pale except for squamal spot. Abdominal tergites II-VI with anterior transverse brown band, band on T II may be narrower or indistinct medially; T VII brownish usually in anterior 1/2-3/4, T VIII in anterior 1/2.

Head. Verticals 21-25, medially in double row to small cluster; postorbitals 4-6. Pedicel with 1 + 4-6 setae; AR 1.63-2.02 (n=5). Clypeus with 25-32 setae. Palpomere length increasing from pm1 to pm5; pm2 without "brush".



Figs 19-21. *C. viator* (Kieffer). 19. Adult male empodium, pulvilli, tarsal claws of hind leg; scale bar: 20  $\mu$ m. 20-21. Pupa. 20. Tergite VII: seta D<sub>2</sub> and armament; scale bar: 20  $\mu$ m. 21. Thoracic horn; scale bar: 100  $\mu$ m.

Thorax setation. Anteprenotals 8-13, all lateral; acrostichals 44-66; dorsocentrals and humerals combined 31-47; prealars 23-25; supraalars 2-3 (exceptionally 4); scutellars 50-60; preepisternals 7-10 in row usually becoming double posteriorly (a single specimen, the rearing from Ireland, unilaterally with 0, on other side 7 irregularly scattered preepisternals).

Wing. VR 0.86-0.98. Squama fringed with 40-52 setae in proximally double row.

Legs. Tibial spurs with 5-9 side teeth: spur length on fore ti 25-55  $\mu$ m, on mid ti 30-68 and 35-70  $\mu$ m, on hind ti 30-65 and 45-95  $\mu$ m. BR<sub>1</sub>

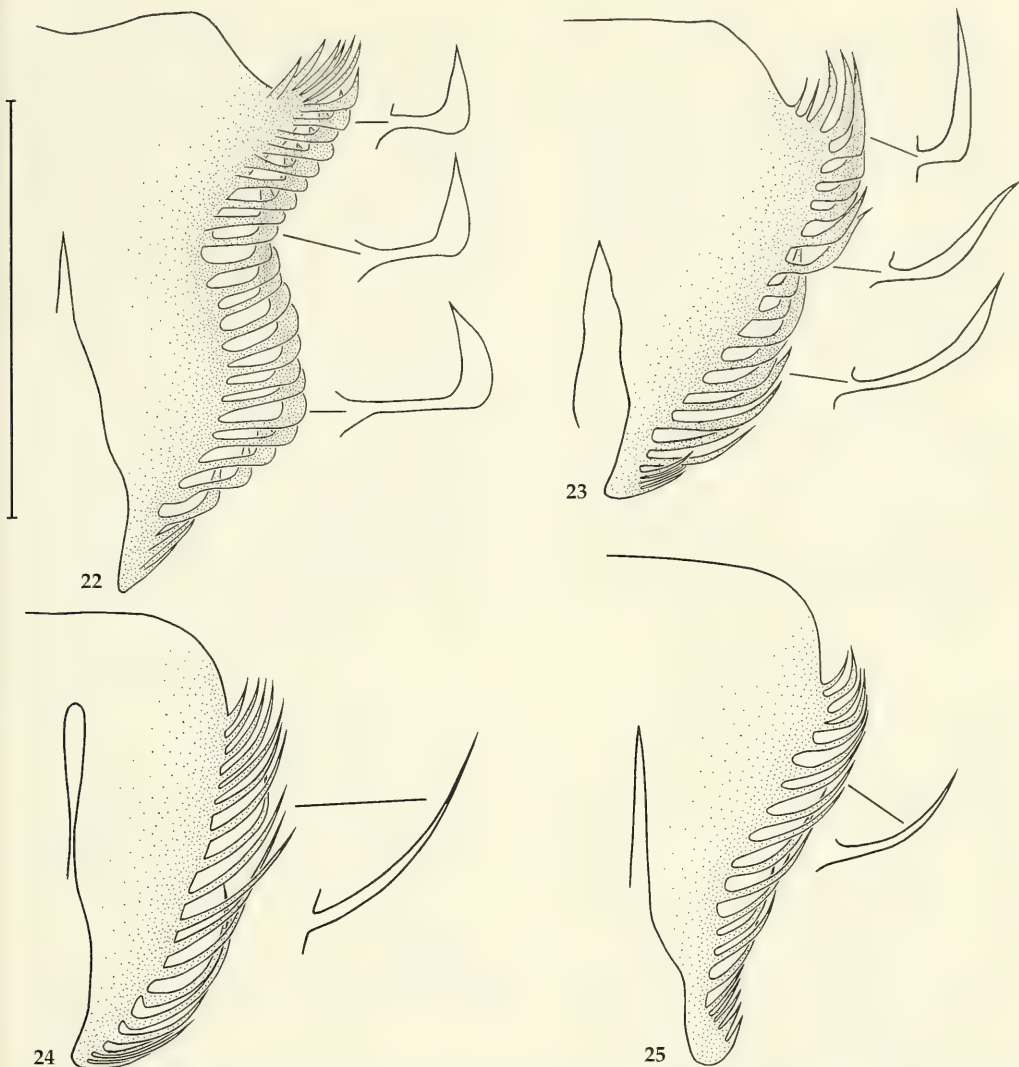
4.5-7.5. Mid tarsomere 3 apical tuft of setae more or less distinct. Pulvilli relatively wide and plumose (Fig. 19). Segment lengths are given in table 4.

LR<sub>1</sub> 0.73-0.77 (n=7), LR<sub>2</sub> 0.55-0.58, LR<sub>3</sub> 0.65-0.69. BV<sub>1</sub> 2.62-2.87, BV<sub>2</sub> 3.29-3.60, BV<sub>3</sub> 2.52-2.71.

Hypopygium similar to that of *C. triannulata* (see Fig. 15). Tergite IX setae: 18-28, including 3-7 on each ridge end. Median volsella length 115-125  $\mu$ m, combined basal width 60-70  $\mu$ m, length/basal width about 1.7-2.1; dorsolateral edge with 15-25 uniformly tapered processes (Fig. 25), additional smaller processes further

Tab. 4. Segment lengths of *Conchapelopia viator* (Kieffer, 1911) (in  $\mu$ m; one complete animal from either end of body size range).

		fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>
♂♂	P <sub>1</sub>	1120/1240	1420/1600	1030/1180	540/600	380/400	260/270	130/130
	P <sub>2</sub>	1180/1320	1220/1350	680/740	330/360	260/280	200/220	90/120
	P <sub>3</sub>	1090/1180	1680/1780	1090/1170	590/660	450/490	270/290	120/130



Figs 22-25. Adult male median volsellae and their dorsolateral processes of *Conchapelopia* species; scale bar: 100  $\mu$ m. 22. *C. pallidula* (Meigen). 23. *C. hittmairorum*, spec. nov. 24. *C. triannulata* (Goetghebuer). 25. *C. viator* (Kieffer).

ventrally, at least at the rounded anterolateral corners of the volsella, where they occasionally intergrade with elongate microtrichia; ventral part of volsella forming a lobe (most obvious on macerated and compressed specimens) densely covered with microtrichia which often appear grouped in scale-like clusters. Gonocoxite with 3-4 distal-dorsal setae (usually all strong but occasionally 1 is weaker), and with 1 separate median seta. Gonostylus without distal-median tubercle or projection near origin of megaseta.

**Adult female** (n=1; pharate, not ready for eclosion).

Total length about 3.5 mm.

Head. AR approx. 0.3; scapus setae 4, 6; pedicel setae 6+1, 7+1. Temporal setae approx. 26, including approx. 21 verticals, medially in cluster; and 5 postorbitals. Clypeus with 20 setae.

Thorax. Anteprenotal setae indiscernible, acrostichals 45-50, dorsocentrals and humerals combined 47, prealars 22, preepisternals 8 in 1-2 rows, supraalars 2, scutellars about 40.

Wing. Squamal setae 39.

Legs. Mid  $ta_3$  apical tuft of setae absent. Tibial spurs with 5-7 side teeth; spur length on fore ti 40  $\mu\text{m}$ , on mid ti 52 and 60  $\mu\text{m}$ , on hind ti 45 and 68  $\mu\text{m}$ . Comb of hind tibia with 7 spines. Pulvilli distinct, as in male.

Genitalia insufficiently preserved.

#### **Pupa** (n=2).

As described by Murray (1974), except as follows.

Length about 5-6 mm. Colour: conjunctives II/III to V/VI medially with brown patch, VI/VII medially infusate.

Cephalothorax. Thoracic horn (Fig. 21) anterior edge curved; horn length 290-360  $\mu\text{m}$ , length/width 2.6-2.8 (but may be lower, as width axis of horns not lying horizontal in described slide mounts); ostia 20-26; plastron plate length almost 2 $\times$  width; rim wide, long and short diameters of rim oval about 1.5 $\times$  plastron plate length and width, respectively; length ratios plastron plate/horn 0.37-0.43, rim/horn 0.60-0.66; respiratory atrium obliquely T-shaped, longitudinal part without meander bends or diverticula, its width up to about 0.3 of horn width in corresponding section, atrium distal transverse part slightly to moderately wider than longitudinal part, blind ends not significantly recurved. Thorax surface granular (tubercles up to 2-4  $\mu\text{m}$  high) from antepnotum almost to thorax comb, and in prealar area; thorax comb of about 20-25 tubercles (some slightly elongate) in mostly double row.

Abdomen. Terga mostly covered with dense armament including bifid and relatively few multi-branched spines; T VIII with median longitudinal strip of more sparse, shorter, and exclusively simple spines. Anteriormost taenia on VII at 0.57-0.66 of segment length from base, on VIII at 0.47-0.51. Anal lobes medially more or less straight, not distinctly expanded to median.

**Taxonomic notes.** Larva unknown (the association reported by Rieradevall & Brooks 2001 is *C. triannulata*).

*C. viator* (Kieffer) is the only western Palaearctic member of the genus with relatively extensive pulvilli. A number of *Conchapelopia* species from other world regions have been re-

ported to possess such structures (e.g., Roback 1971, Sasa & Kikuchi 1995), usually described as "small". However, a male of *C. cygnus* (Kieffer) at ZSM has pulvilli at least as large as on *C. viator*, and those figured for *C. pallens* (Coquillett) by Roback (1971: fig. 423, as *C. goniodes*) and Bilyj (1985: figs 7-9) are of similar size.

The presence of extensive pulvilli does not appear to indicate a phylogenetic lineage in *Conchapelopia*, since species groupings based on character complexes of the male genitalia each contain both members with and without such pulvilli.

**Distribution and biology.** *C. viator* (Kieffer) has a widespread distribution in the western Palaearctic (but is unknown from Scandinavia). Verified or plausible records are known from Austria, the Czech Republic, France, Great Britain, Hungary (Zilahi-Sebess 1944), Ireland, Portugal, Romania (Albu 1966), and Spain (see also Soriano et al. 1997). Kieffer's holotype was collected in Germany, but the present authors have not yet seen any verifiable *C. viator* from this country. The single Pe reported from Bavaria in Reiss & Reiff (1995) is a *C. pallidula* misidentified due to a thoracic horn distorted in slide-mounting. Records from Slovakia based on Bitušik (1993) instead apply to *C. triannulata*.

*C. viator* (Kieffer) has been considered a rheobiontic and cold-stenothermic species (Fittkau 1962, Murray 1974). All available immature specimens have been taken in rivers. Compared to the other species treated the period of adult presence appears shortened, extending from mid April only through late August.

#### **Acknowledgements**

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